

## Review Article

# Automated microneedling device – a new tool in dermatologist's kit – a review

S. Arora, P. Bhandaree Gupta

Department of Dermatology, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar

**Abstract** Microneedling is being used in dermatology for mainly two purposes, firstly, collagen induction therapy for scars, stretch marks and antiageing effect and secondly, for deep transdermal delivery of active substances through epidermal barrier (stratum corneum). The micro-channel formation enhances penetration of product and stimulates collagen production for rejuvenation and treatment of acne scars and stretch marks. Dermarollers have been widely used for same. The motive of this article is to highlight a new device called Automated Microneedling Device and to compare it with dermarollers.

**Key words**

Microneedling, collagen induction therapy, dermarollers, automated microneedling device.

## Introduction

Skin needling or microneedling therapy combines Chinese acupuncture technique with mesotherapy. In 1995, Orentlich and Orentlich described subcision (dermal needling) as an effective treatment for scars.<sup>1</sup> Dr. Andre Comirand, a Canadian Plastic Surgeon, in 1997 reported surprising improvement in texture and colour of hypochromic facial scars after scar camouflage tattooing done on scars. The insertion of tattoo gun needles have lead to breakdown of scar collagen tissue and have stimulated synthesis of new healthy collagen leading to improvement of scar texture.<sup>2</sup>

In 2006, Fernandes developed Percutaneous Collagen Induction Therapy using Dermaroller.<sup>3</sup> Dermarollers gained popularity in treatment of

acne scars, stretch marks, trauma and post surgery scars. Dermarollers proved to be very beneficial in transdermal delivery of many anti-aging products (e.g. lipopeptides) and treatment of androgenetic alopecia with minoxidil and stem cells.

Dermaroller is a drum shaped roller with 192 stainless steel needles in eight rows. The length of the needles can vary from 0.5 mm to 1.5 mm & diameter is 0.1 mm. They are presterilized by gamma irradiation. Dermarollers are for single use only.

Although dermarollers are easy to use and are also available in home usable version but there are some disadvantages e.g. the pressure with which rolling has to be done comes with practice and experience, it is difficult to treat small areas or localized scars as the roller damages adjoining skin too. All these shortcomings led to origin of Automated Microneedling Device or Dermapen®.

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### Address for correspondence

Dr. Swati Arora,  
97, Inderjit Colony,  
Opposite Mata Kaulan Hospital,  
100 Feet Road, Amritsar,  
Punjab 143001  
Ph: +919815948806  
Email: swatisarabdeep@gmail.com

### Automated microneedling device

► *The instrument:* It is a pen like instrument with handle (**Figure 1**), disposable needles, guides (to adjust needle length).It comes with a rechargeable battery .The needle tip is having 9-12 needles arranged in rows (**Figure 2**).It is having two modes of operation ,the high speed mode(700 cycles/min) and the low speed mode(412 cycles/min).

► *Advantages of automated microneedling device*

- (1) It is automatic & rechargeable.
- (2) Easy to use as the user has to just put the device in stamping action on skin & the perpendicular movement of needle leads to penetration at required depth.
- (3) Safe to use since the needle tips are hidden inside the guide.
- (4) Needle tips are disposable. Same hand piece with a new needle tip and guide can be used on different patients.
- (5) More convenient to treat narrow areas such as nose, around eyes, or mouth without damaging the adjoining skin. Needle tip diameter is 10 mm & the hand piece allows the physician to treat areas in any desired direction.
- (6) Needle length is adjustable with the help of guides. Same needle can be adjusted to different length with help of different guides for different areas of face.
- (7) Less painful as it is automatic & fast , moreover the needle tips are inserted perpendicularly.
- (8) It is economical as there is no need to buy a new instrument every time , just replace the needle tip.



**Figure 1** Automated microneedling device.



**Figure 2** Needle tip with guard

### Microneedling-indications

► *Penetration enhancement*

Cutaneous permeation of any substance occurs when an active ingredient is released from its delivery vehicle( e.g. ointment, cream, liquid, gel) through epidermal skin barrier into the deeper layers of skin.

As the Fick's law suggests that molecules travel from a region of high concentration resulting in

complete diffusion of two substances involved. High lipid content of facial skin allows diffusion of lipid soluble products while water based products requires delivery systems and penetration enhancers<sup>4</sup>.

Verbaan *et al.* in 2007 proved that microneedle arrays of 0.5 mm or more penetrate the skin sufficiently to increase diffusion of substances up to 72000Da.<sup>5</sup> Many other substances e.g. calcein<sup>6</sup> and hyaluronic acid have shown increased penetration with microneedling.

#### ► *Scar reduction*

Research shows that scar tissue is formed when the damaged layers of epidermis are repaired in presence of TGF- $\beta$ 1 and 2. It has also been proved that inhibiting TGF- $\beta$ 1 and 2 leads to scar free healing.<sup>7</sup>

Microneedling have shown to start collagen formation and production of healing agents but without removing epidermis and without causing hyperpigmentation.<sup>8</sup> Hence microneedle therapy promotes healing with less epidermal damage and small recovery time than other ablative or resurfacing techniques.<sup>9</sup>

Microneedle therapy can therefore be used to remove and fade old scars. A similar study by Majid confirmed efficacy of microneedling with dermaroller in treatment of atrophic facial scars.<sup>10</sup>

#### ► *Collagen induction*

Microneedling causes microscopic breaks in the blood vessels immediately below epidermis. This process releases blood platelets that are responsible for blood clotting. The platelets release a series of growth factors that promote the production of collagen, elastin and growth factors. In turn collagen and elastin help to tighten & smoothen the skin.<sup>11,12,13,14</sup>

### **Preparation for microneedling**

Prior to microneedling application of topical vitamin A and C for at least 4 weeks before the procedure is beneficial.<sup>11</sup>

### **Microneedling procedure**

- Patient's skin is first cleaned with ethyl alcohol followed by ether to remove all oils on skin surface.
- Topical anaesthetic cream is then applied to skin. The area is then covered for 30 min with cling film to ensure effective skin anesthesia.
- Once anesthesia has fully developed, physician can start microneedling process.
- The patients are usually able to bear the sensation well. Those who have low pain threshold or are very anxious, an analgesic or tranquilizer can be given before procedure.
- Once microneedling is complete the treated skin should be cleaned with normal saline & serum containing vitamin A, C or E can be applied. After the treatment, patient can expect to appear as if being exposed to the sun for a long duration.

### **Care after microneedling**

- The normal skin care regimen (including sunscreen lotion) should continue.
- The patient can return to work & social life a day after treatment.
- The skin will become more radiant and smooth after about 10 days of procedure.
- If any area appears red than normal, it should be reported to the doctor as it may indicate small infection, herpes labialis or acne.

- Next session of microneedling can be conducted after 2-4 weeks.

### Advantages of microneedling

- This procedure can be done with topical anesthesia. No sedation is required.
- Patient can go to work the very next day.
- Bruising is very rare.
- Selective response as collagen stimulation is there without any aggressive inflammatory response. Fat cells are not damaged.
- Affordable.
- Six to ten sessions at a gap of four weeks are generally sufficient.
- Can be combined with other procedures .e.g. chemical peeling.<sup>15</sup>

### Conclusion

Microneedling is a simple, inexpensive procedure with no down time, with promising results in acne scars, hair loss and wrinkles. Automated microneedling device has further added to the comfort of physicians for doing the treatment with more precision and less side effects.

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